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THE PRAIRIE DOG OF THE GREAT PLAINS.

BY

C. HART MERRIAM,

Chief of Division of Biological Survey.

[REPRINT FROM YEARBOOK OF DEPARTMENT OF AGRICULTURE FOR 1901.]

[1902].

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CONTENTS.

	Page.
Introduction.....	257
General habits of prairie dogs.....	258
Time of birth and number of young.....	260
Mounds and burrows.....	260
Natural enemies.....	262
Recent increase and spread of prairie dogs.....	263
Food.....	264
Destructiveness.....	264
Popular interest in the destruction of prairie dogs.....	265
Methods of destruction.....	265
Obstacles and difficulties of extermination.....	269
Prairie dogs on Nantucket.....	269

ILLUSTRATIONS.

PLATES.

PLATE XXII. The plains prairie dog (<i>Cynomys ludovicianus</i>).....	258
XXIII. Mounds of the plains prairie dog: Fig. 1.—Normal mound in new ground (alfalfa field). Fig. 2.—Mound repaired by scraping up earth from the outside. Fig. 3.—Inside of rim of mound, showing nose marks.....	260
XXIV. Mounds of the plains prairie dog: Fig. 1.—Mound in flooded ground, showing protection from rains. Figs. 2 and 3.—New mound in alfalfa field.....	264

TEXT FIGURES.

FIG. 24. Distribution of plains prairie dog (<i>Cynomys ludovicianus</i>).....	257
25. Prairie-dog burrow.....	261

THE PRAIRIE DOG OF THE GREAT PLAINS.

By C. HART MERRIAM,
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INTRODUCTION.

In crossing the United States by any of the transcontinental railways the traveler who looks out from the car window on the second day westward from Chicago is sure to have his attention arrested by colonies of small animals about the size of cottontail rabbits. These animals are prairie dogs. Some stand erect at the mouths of their burrows, view-

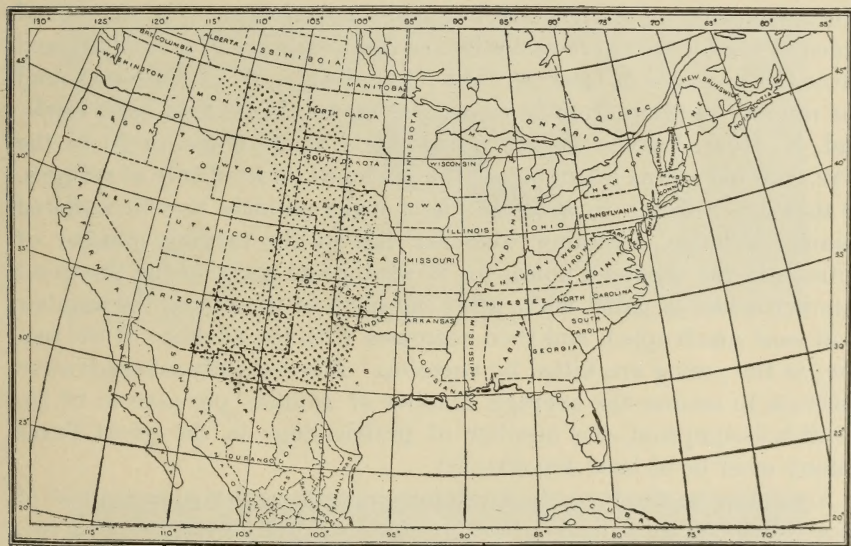


FIG. 24.—Distribution of plains prairie dog (*Cynomys ludovicianus*): The occupied area is marked with dots.

ing the passing train; others are engaged in feeding or running to and fro about the colony. The land they occupy is the broad expanse of level and slightly rolling semidesert country known as the Great Plains, a vast tract which stretches from the Rocky Mountains easterly to the western edge of the Mississippi Valley, and from Montana and North Dakota southward to Texas and Mexico. (See fig. 24.) The plains are treeless, except along the streams, and the ground is sparsely covered with grass and other small plants, which are green in early spring and brown the greater part of the year.

The prairie dog loves sunshine and a dry atmosphere, and in ranging easterly from the arid plains toward the humid prairies of the Mississippi Valley becomes less and less numerous, till between the ninety-seventh and ninety-eighth meridians he disappears altogether. Not even the luxurious vegetation of the prairies is sufficiently attractive to lure him into the humid belt adjoining his chosen home. That he is fond of rich vegetation and prefers it to the dry bunch grass of the plains is shown by his great destructiveness to alfalfa, grain, and other crops grown on irrigated lands within his range. This is an important illustration of the law that in fixing the limits of distribution of animals climatic factors are even more potent than food.

The prairie dog is preeminently a social animal, living in colonies which vary in extent from a few acres to thousands of square miles and inhabited by thousands, and in some cases millions, of animals. Colonies 20 to 30 miles in length are not rare, and in Texas one is known which measures about 250 miles one way by 100 to 150 the other, covering an area of about 25,000 square miles. The number of holes in use on each acre varies from a few to upward of a hundred, and probably averages at least 25. At Alma, Nebr., W. H. Osgood found the number ranging from 35 to 64, and on an alfalfa field near Carlsbad, N. Mex., Vernon Bailey found 1,009 on 20 acres, or 50 to the acre. In old towns many holes are abandoned, or used only as refuges, so that it is difficult to ascertain how many animals live in a stated number of holes. Another difficulty lies in the varying number of animals in the occupied holes, for in winter and early spring the usual number is two (a pair), while after the birth of the young the number is at least quadrupled, and then decreases with the advance of the season, as the young are killed by enemies. It is certainly a conservative estimate to assume the average number of animals per acre to be 25. On this assumption, the number of prairie dogs in the great Texas colony must be at least 400,000,000.

According to the formula for determining the relative quantities of food consumed by animals of different sizes (kindly given me by Prof. W. W. Cooke), 32 prairie dogs consume as much grass as 1 sheep, and 256 prairie dogs as much as 1 cow. On this basis the grass annually eaten by these pests in the great Texas colony would support 1,562,500 head of cattle. Hence, it is no wonder that the annual loss from prairie dogs is said to range from 50 to 75 per cent of the producing capacity of the land and to aggregate millions of dollars.

GENERAL HABITS OF PRAIRIE DOGS.

When a person approaches a dog town the animals see him a long way off and keep a close watch on his movements. As he comes nearer an alarm note is sounded, at which those away from their burrows rush to the entrance mounds, where they sit or stand erect, nervously twitching



PHOTOGRAPHED BY C. HART MERRIAM.

HELIO TYPE CO., BOSTON.

THE PLAINS PRAIRIE DOG (*CYNOMYS LUDOVICIANUS*).

their tails and chattering or barking excitedly. If he continues to move toward them the excitement increases, and most of the animals on the near side of the colony plunge headlong into their burrows. Some withdraw more slowly, and for some time their heads and eyes may be seen peering up from the funnel-shaped openings of the mounds. Those near by are usually silent, while those at a little distance continue to scold and chatter. This chattering or barking, as it is usually called, can often be heard after the animals have gone down out of sight in their holes. (Pl. XXII.)

Along railroads the animals have become so accustomed to the trains that they no longer take fright as the great noisy engine rushes madly by, and they are best observed, perhaps, from the windows of passing trains. Their indifference at such times is amazing. I have often watched them from the "Overland Limited," some standing erect on their mounds; others chasing one another about or quietly feeding within 40 or 50 feet of the roaring, rushing train, without showing the least outward sign that anything unusual was happening. One would think the fury and deafening roar would be too much for their nerves, but they appear to regard it with absolute unconcern. It is extraordinary how soon animals lose their fear of naturally terrifying objects when such objects come and go frequently without doing them bodily violence.

In summer, prairie dogs are most active mornings and evenings, usually remaining in their holes during the hotter part of the day. In fall they become very fat, and apparently sleep a good deal; at least, they are much less regular and are less frequently seen. In winter, in the southern part of their range, they may be seen nearly every day unless it is stormy. Thus, in Texas and New Mexico they are said to come out in good weather shortly after sunrise, even at times when the temperature is below freezing. On the northern plains they hibernate irregularly, but still appear at intervals. The periods of hibernation are probably determined by storms and by the length of time the ground is covered with snow, for in Montana and Wyoming they have been known to appear, in places where the ground was bare, on calm sunshiny days in midwinter when the mercury stood at or below zero.

Prairie dogs, like the desert species of kangaroo rats, pocket mice, ground squirrels, and other rodents of arid regions, are able to live and thrive without drinking. In many places the only moisture they take into their systems is the small quantity contained in the dry grasses, seeds, and roots they eat. In arid western Texas they are abundant in places where the annual rainfall is slight and uncertain and where some years pass without any rain. With respect to the theory that their burrows are deep enough to reach water, it need only be said that in some of the dog towns artesian wells have been sunk to the depth of 1,000 feet without striking water.

TIME OF BIRTH AND NUMBER OF YOUNG.

The time of reproduction varies with the latitude and altitude, but exact information as to the dates of birth and the number of young in a litter in different parts of the plains is not at hand. In Texas the young are usually seen at the mouths of the holes in early May, while in North Dakota and Montana they rarely appear before the latter part of May or first week of June. The usual number of young seems to be four, but the cases in which the number is definitely known are few.

MOUNDS AND BURROWS.

The mouth of each burrow opens in the middle of a mound, which is usually a foot high and 3 or 4 feet in diameter (Pl. XXIII, fig. 1). The mound increases in size with age, those that have been used for many years attaining a height of $1\frac{1}{2}$ or 2 feet and a diameter of 8 or 10 feet. The interior of the mound is funnel-shaped, forming an elevated crater-like rim around the entrance of the hole. This is pressed into form by the nose of the animal, as may be seen in Pl. XXIII, fig. 3, which shows prints of the nose all around the inside. After injury from rains or other causes the rim is repaired by scraping up the ground from outside (Pl. XXIII, fig. 2). Sometimes the repairs are made before rains, and some observers regard the animals as exceptionally clever weather prophets. Thus, Maj. H. W. Merrill states that whenever they are busy scraping the earth up around their burrows and pressing it into place with their noses rain is sure to follow in a very short time. The chief object of the elevated rim is to keep the water out of the burrows when the ground is flooded by sudden rains, as shown in Pl. XXIV, fig. 1. The ground immediately surrounding each burrow is usually cleared of small plants and kept clean and bare, and where burrows are near together the bare areas often join, so that in thickly populated colonies the ground is hard and smooth like a playground, and the animals are obliged to go some distance for food. This they dislike to do, lest they be pounced upon by enemies; hence, when the grass near their burrows has been consumed they dig new holes nearer the supply. It takes a long time for vegetation to regain a foothold on the hard floors of the dog towns, and the sites of old towns remain conspicuous for years after they are abandoned.

The holes go down for some distance at a very steep angle and then turn at nearly a right angle and continue horizontally, rising somewhat toward the end. The nests are in side chambers connecting with the horizontal part of the burrow, and usually, if not always, at a somewhat higher level (fig. 25, *H*). Recently, at Alma, Nebr., W. H. Osgood dug out a burrow, of which he made a careful diagram (fig. 25), accompanied by measurements. In this case the

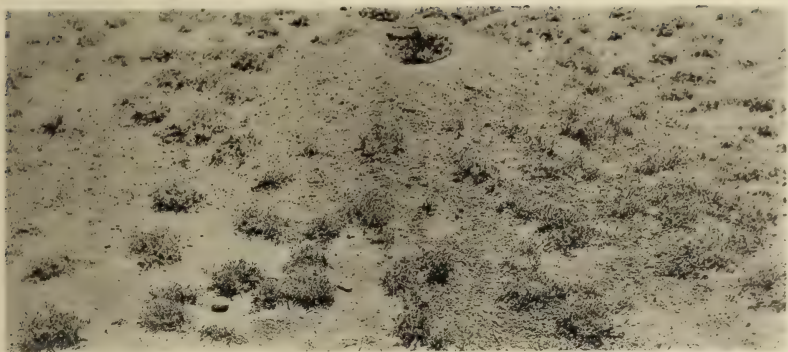


FIG. 1.—NORMAL MOUND IN NEW GROUND (AN ALFALFA FIELD).



FIG. 2.—MOUND REPAIRED BY SCRAPING UP EARTH FROM THE OUTSIDE.



PHOTOGRAPHED BY VERNON BAILEY.

HELIO TYPE CO., BOSTON.

FIG. 3.—INSIDE OF RIM OF MOUND, SHOWING NOSE MARKS.

MOUNDS OF THE PLAINS PRAIRIE DOG.

burrow went down nearly vertically to a depth of $14\frac{1}{2}$ feet below the surface, when it turned abruptly and became horizontal, as shown in the diagram. The horizontal part was $13\frac{1}{2}$ feet in length. One-third of the horizontal part (the terminal 4 feet, *F*) and two old nests and passageways (*E*) were plugged with black earth brought in from

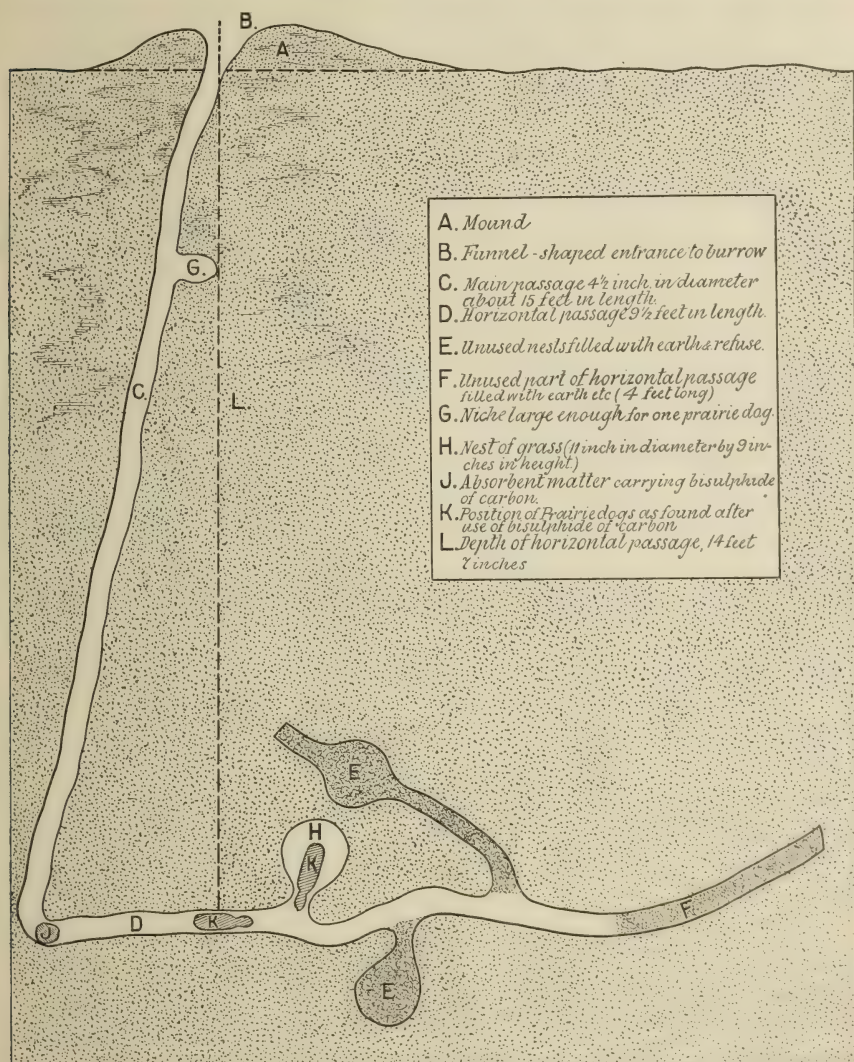


FIG. 25.—Prairie-dog burrow.

the surface layer, which was very different from the light-colored clayey earth in which the greater part of the burrow lay. Four or five feet below the entrance was a diverticulum, or short side passage (*J*), probably used as a place in which to turn around when the animals come back to take a look at the intruder before finally disappearing in

the bottoms of their burrows. It is also used, apparently, as a resting place where they bark and scold after retreating from the mouths of the burrows. As elsewhere noted, they are often heard barking after they have gone in. The burrow was opened the day after bisulphide of carbon had been used for destroying the animals, and the material carrying the bisulphide was found at the bottom of the vertical part, just where the horizontal part turns off. Two dead animals were found, one in the horizontal part, the other in the nest, as indicated by the letter *K* in the diagram.

NATURAL ENEMIES.

The prairie dog has several mortal enemies which, when not interfered with by man, usually serve to hold its numbers in check. The most inveterate of these appear to be the coyote, badger, black-footed ferret, and rattlesnake. Their methods of attack differ widely.

The coyote sneaks up to the borders of a colony, hiding behind straggling tufts of vegetation and depending largely on his protective coloration for concealment. He usually approaches when the animals are in their burrows, and strives to reach some object behind which he may hide and lie in wait until some unwary inhabitant comes out to feed, when by a quick rush it may be headed off and caught.

The badger usually drives his prey into its burrow and then deliberately digs it out. He is for his size one of the most powerful animals in the world. His foreclaws are long and strong, and his sense of smell is highly developed. On sniffing a prairie dog or gopher in its burrow, he simply bores down to his victim, which has no possible means of escape.

The black-footed ferret is built like a weasel, and though much larger, is small enough to enter and traverse freely the burrows of prairie dogs, so that he is able to pursue them to the ends of their holes and capture them with absolute certainty. He is, therefore, one of their most relentless and terrible enemies, and if sufficiently abundant would quickly exterminate all the inhabitants of the largest colonies.

The rattlesnake, like the ferret, glides silently into the hole, but is said to confine his attentions to the young, which he takes from the nest or seizes in the passageways. Travelers on the plains, from the time of Lewis and Clark to the present day, speak of finding young prairie dogs in the stomachs of rattlers killed in the dog towns. The usual number so found appears to be one or two, but Dr. J. A. Allen states that he once found three. One author claims that in Texas these reptiles live almost wholly on the young of the prairie dog and do more, perhaps, to keep down the numbers than all other agencies. This writer continues:

A curious thing about the snake and the dog is that each is mortally afraid of the other. The dog is afraid of being eaten by the snake, and the snake is afraid of

being entombed by the dog. If the mother of the young dogs, on a return to the home hole, finds that a snake has intruded, she at once sets up a peculiar cry or bark, to which all the citizens of the town at once respond. They gather about the hole, and in a moment all are at work filling it up. The quickness with which they can do this is remarkable. When the hole is filled they butt and pack the dirt in the mouth of the hole till it is almost as hard as the prairie adjacent. There is no chance for an escape of the invader. He is sealed up in his tomb. The snake understands this danger, and is prepared to escape from it on the least warning. A handful of dirt thrown in a hole where the snake is will bring him with all speed out of the hole, because he is under the impression that the dogs are about to seal him up.¹

There are other enemies also, such as cougars or mountain lions, bobcats, eagles, hawks, and owls, but most of them are not sufficiently abundant on the Great Plains to be regarded as important factors in holding the prairie dog in check. Still, in some localities, hawks and owls kill large numbers of the young. They should be protected and encouraged.

RECENT INCREASE AND SPREAD OF PRAIRIE DOGS.

Formerly the area of available land in proportion to the population was so great that little attention was paid to such pests as prairie dogs and gophers. But in recent years the development of improved methods of farming, including irrigation and artesian water supply, has led ranchmen to push farther and farther westward over the semi-arid plains, until agriculture and stock raising have invaded most parts of the prairie dog's domain, the land holdings have decreased in size and increased in value, and the depredations of pests are more keenly felt.

On many parts of the plains prairie dogs are now more abundant than formerly and their colonies have overspread extensive areas previously unoccupied. This is due to the coming of the white man, whose presence favors their multiplication in two ways—(1) by increasing the food supply, and (2) by decreasing the animal's natural enemies. The white man cultivates the soil and thus enables it to support a larger number of animals than formerly; at the same time he wages warfare against the coyotes, badgers, hawks, owls, snakes, and other predatory animals which had previously held the prairie dogs in check. Thus favored, the prairie dogs have multiplied until they have become one of the most pernicious enemies to agriculture. The increase of late years is well known to ranchmen on the plains, but for the information of others a few definite instances recently collected by my assistants may be of interest.

Richard Harrison, of Blunt, S. Dak., states that ten years ago there were possibly 25 occupied burrows on his land; the animals increased slowly and six years ago not more than 10 acres were infested. Since then the increase has been so rapid that at present the area they occupy covers about 160 acres.

¹ American Field, p. 194, March 11, 1899.

O. E. McArthur, also of Blunt, S. Dak., states that about fifteen years ago his children noticed two or three burrows about a mile from his house, and that no particular attention was paid to the inmates, which, during the next few years, increased slowly. A little later, however, they spread over so much land that their multiplication became a matter for serious alarm. At present they occupy a full quarter section (160 acres), having surrounded Mr. McArthur's house and taken possession of all the land near it.

A cattle ranch in Logan County, Kans., which ten years ago pastured a thousand head of cattle, will barely support 500 at present, owing to the great increase in prairie dogs, which have overrun the range. Practically, the whole of the southern half of Logan County is now one continuous dog town, estimated to cover about 300 square miles. In the past decade the population of this area has decreased, a post-office (Elkader) has been abolished, and many homes have been vacated, the result, it is said, of the great increase in prairie dogs.

At Carlsbad, in the Pecos Valley, New Mexico, in September, 1901, Vernon Bailey studied a colony of prairie dogs which completely covered a 20-acre alfalfa field, 4 or 5 acres in each of two adjoining fields, and several acres of prairie. He was told that this large colony had spread in three years from a small one in a corner of the alfalfa field.

E. W. Nelson states that when he and his brother located ranches in a mountain valley in eastern Arizona in 1884, the only prairie dogs in the vicinity were a colony 3 miles distant, inaccessible except by way of a narrow box canyon. About three years later a prairie dog's burrow was found on the ranch, after which the animals multiplied steadily, until in 1895 they occupied a large part of the valley.

Complaints are constantly received of the spread of the pests on farm lands adjoining Government, railroad, school, and other lands, over which the inhabitants have no jurisdiction. This is a very serious evil, and one with which it is exceedingly difficult to cope.

FOOD.

The normal food of the prairie dog is grass, chiefly the bunch grass of the plains. In addition to this, grass roots, other plants, seeds, and sometimes insects are eaten.

DESTRUCTIVENESS.

The damage done by prairie dogs consists in the loss of grass and other crops eaten, or buried under the mounds; in the accidental drainage of irrigation ditches,¹ and in the danger to stock from stum-

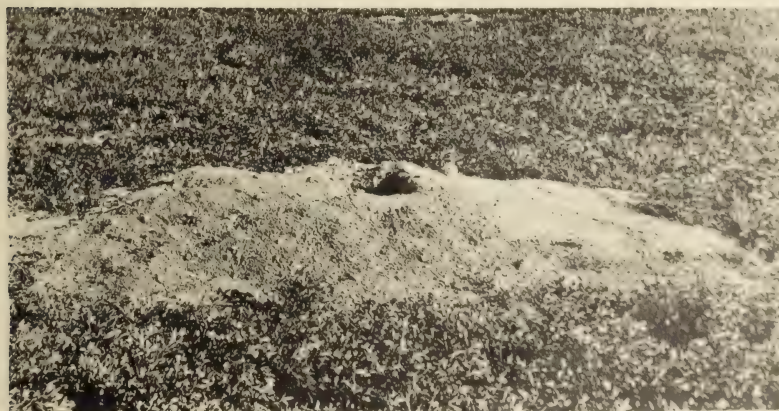
¹ In Stillwater Valley, Montana, an irrigating ditch on a side hill was tapped by a prairie dog burrow and the water came out 50 feet lower down on the slope. The hole was twice stopped and the ditch moved a little, but the break recurred, and it was finally necessary to dig a new ditch around the washout.



FIG. 1.—MOUND IN FLOODED GROUND, SHOWING PROTECTION FROM RAINS.



FIG. 2.—NEW MOUND IN ALFALFA FIELD.



PHOTOGRAPHED BY V. BAILEY AND W. H. OSGOOD.

FIG. 3.—NEW MOUND IN ALFALFA FIELD.

MOUNDS OF THE PLAINS PRAIRIE DOG.

bling in the holes. Running horses often trip and break their legs, and riders are sometimes injured and even killed.

On ranch lands prairie dogs have proved destructive to a variety of crops, among which are alfalfa (Pl. XXIV, figs. 2 and 3), grain, potatoes, and sugar beets, and on grazing lands they are said to consume, or bury under their mounds, so much grass that the capacity of the land for supporting stock is reduced, as already noted, from 50 to 75 per cent. A prominent Texas newspaper recently published an editorial containing the following:

No man who has not gone through the portions of Texas infested by prairie dogs can conceive the enormous ravages they have committed. Millions of acres of land once covered with nutritious grasses have been eaten off by these animals, until the land is naked and worthless, and will remain worthless so long as the prairie dog remains. They invade the farms and eat down the growing crops. Here and there individual effort has been made to destroy them, without avail, and their numbers steadily increase, until they are a menace to the prosperity of the land.

POPULAR INTEREST IN THE DESTRUCTION OF PRAIRIE DOGS.

The general apathy of a few years ago, when land was plentiful and of little value, has given place to widespread and active effort to rid the country of the pests. Wherever our field experiments have been made, from the Dakotas to Texas, the inhabitants were found fully awake as to the necessity for immediate action, and hundreds, if not thousands, of them had already expended time and money in single-handed efforts. The recent attempt of the National Government to ascertain the simplest and most efficient means of combating the evil has been received with universal approval. With one or two exceptions, our field men were granted free access to private lands, and in most instances were enthusiastically received and accorded every assistance and courtesy. In some cases, where the animals are rapidly increasing, the actual and prospective losses are so great that ranchmen expressed their willingness to pay for the destruction of the animals at a rate per acre exceeding the actual market value of the land.

METHODS OF DESTRUCTION.

In the case of prairie dogs, as in the case of gophers and ground squirrels, numerous remedies have been suggested and tried, most of which have met with a certain measure of success. Few, however, have proved available on a large scale. It is easy to destroy isolated animals, and to completely exterminate the inhabitants of small isolated colonies, but, as a rule, the problem confronting the sufferer from prairie dogs is one of larger dimensions; to cope with it successfully means the employment of measures and remedies that are simple, easily handled, available on a large scale, and last, but not least, not too costly (either for materials or labor) to be used over areas comprising thousands of acres. The cost on large ranches

should not exceed 18 cents per acre, and should fall as far short of this as possible.

Among the measures that succeed well enough on a small scale or under special conditions are trapping, drowning, destruction by domesticated ferrets, and capture in sand barrels and straw barrels placed over the holes. On a large scale, poisoning and fumigating have yielded the best results.

POISONING.

By poisoning is meant the administration of a poison or combination of poisons by means of some article of food which the animals will readily eat. The poisons most in favor are strychnine and cyanide of potassium. Phosphorus also has been used and is an ingredient of many of the poison mixtures sold in the stores. It is efficient, but its use is attended with danger, and it is not recommended by this Department.

CYANIDE OF POTASSIUM.—Cyanide of potassium kills quickly, and is an excellent poison, but it is sometimes difficult to administer, chiefly on account of its odor, which is offensive to most animals. Like phosphorus, it is dangerous to man, and must be handled with great care. It is said to lose its power when wet or exposed to the atmosphere. It has been administered in prunes and raisins, and (in combination with strychnine) is a component of the celebrated Peters mixture for poisoning grain, in which it is disguised by a coating of molasses, flavored with oil of anise.

STRYCHNINE.—Strychnine is probably, all things considered, the best and most satisfactory poison now known for the destruction of prairie dogs. It can be obtained everywhere, usually at a moderate price, and its use is simple. The minimum dose necessary to kill prairie dogs is not known, but it is safe to say that the quantity recommended in the Peters formula (3 ounces to a bushel of wheat) is excessive. Two ounces is doubtless sufficient, and $1\frac{1}{2}$ ounces is probably enough. (For ground squirrels, 1 ounce to the bushel of grain is ample.) The strychnine sulphate should be dissolved in warm water, in which the grain should be soaked for twenty-four or thirty-six hours, until all is absorbed. Some experimenters find this sufficient; others prefer to sweeten the grain by stirring in a quart or two of molasses and sprinkling with enough corn meal to prevent sticking. Some use corn meal alone, made into pellets, without any whole grain. Another way to administer strychnine is to introduce small quantities in prunes or raisins, in pieces of apple, carrot, or turnip, or on bread and butter. In the last case it is said that the strychnine should be sprinkled on buttered bread and then coated lightly with sirup, after which the bread is cut in small squares and placed around the burrows. The cost of strychnine sulphate, as customarily sold in small Western

towns, is \$1.50 to \$2 per ounce. It comes in 1-dram (4-ounce) bottles which usually retail for 25 cents. Assuming that 2 ounces is the quantity necessary to poison a bushel of grain, the poisoned grain would cost about \$5 per bushel. Allowing a tablespoonful to be the average quantity necessary to scatter about each hole, and allowing 50 holes to the acre,¹ a bushel of grain will poison 40 acres, at a cost of 12½ cents per acre. A man can scatter poisoned grain over 50 acres or more per day; hence, if labor costs \$1 per day, the expense per acre of putting out the poison would be 2 cents, which added to the above 12½ cents for materials, makes the total cost 14½ cents per acre. The first application of the poison, if carefully made in late winter or early spring when food is scarce, may be counted on to kill 75 to 80 per cent of the animals (and has been known to kill as high as 95 per cent), and this at a cost per acre of less than 15 cents. The second application, a week or two later, is aimed at the few remaining occupied holes, which should not average more than two or three to the acre, and the cost per acre should not exceed 1, or at most, 2 cents. If any animals remain, they may be killed by bisulphide of carbon, and in many cases it is better to do away with the second poisoning and use bisulphide to kill off those that are left after the first poisoning.

FUMIGATION.

By fumigation is meant the destruction of animals by fumes arising from substances thrown into the burrows, as bisulphide of carbon, or generated outside and forced in by mechanical appliances known as "fumigators." Fumigators are devices by means of which fumes from burning sulphur or other materials are pumped into the burrows. In parts of the West, particularly California, they have been used with success in killing gophers and ground squirrels. They have been successfully used also against prairie dogs, but their employment for this purpose does not appear to be gaining ground.

BISULPHIDE OF CARBON.—Bisulphide of carbon is a volatile liquid which rapidly loses its strength on exposure to the air, and should be kept in tightly corked bottles or cans, which, when used, should be immediately recorked. It is inflammable and highly explosive, and should never be opened in the vicinity of a light or fire. Its fumes are heavier than atmospheric air, and when introduced into burrows sink quickly to the bottom.

The method of application is exceedingly simple. The usual dose for prairie dogs is 1 ounce (about a tablespoonful). This quantity should be poured on some absorbent substance, such as a lump of horse manure, a corncob, a handful of rags, or even a clod of earth, which

¹A large average, but made to include unoccupied holes, as it is much cheaper to put out a little extra grain than to plug the holes to find out which are occupied. Furthermore, grain scattered anywhere in the dog towns is liable to be eaten.

should be immediately dropped into the burrow, the mouth of which should then be closed.

For introducing the bisulphide there is nothing better than dry horse manure—a material which costs nothing and is always at hand. A lump of horse manure wet with the bisulphide and dropped into a hole falls at once to the bottom of the vertical part, as shown in the diagram (fig. 25, *J*), where it is very near the animals. The liquid can be used to best advantage after a rain, when the interspaces in the soil are filled with water, so that the fumes are less readily diffused into the surrounding ground. This, however, is of much less consequence in the case of prairie dogs, which are deep-burrowing animals, than in the case of pocket gophers and ground squirrels, whose burrows and tunnels, as a rule, lie much nearer the surface.

Crude bisulphide, suitable for killing prairie dogs and other burrowing animals, costs about 10 cents per pound in 50-pound carboys or drums. A dollar's worth is enough to poison 100 holes. The cost, therefore, is about 1 cent a hole. The fluid should not be introduced haphazard into the burrows of a colony, but should be used only in those which the animals have been seen to enter immediately before it is applied. In this way none is wasted on unoccupied holes.

GENERAL DIRECTIONS FOR PRAIRIE-DOG DESTRUCTION.

Poisons are of very little use except in winter and early spring, when the ordinary food of the prairie dog is scarce and difficult to obtain. At such times poisoned grain, vegetables, fruit, and bread and butter are freely eaten. In distributing the poisoned grain or other material, it is usually better to scatter it about the holes instead of putting it into the mouths of the burrows, where it gets mixed with the dirt and is trodden down by the animals and lost. An exception to this course is recommended in case of the use of pellets of grain, made by wrapping teaspoonful doses of poisoned grain in greasy tissue paper; these should be dropped into the burrows. The danger to stock is much less when the grain is scattered about the colony than when it is placed in spoonfuls at or near the openings of the burrows. In case any considerable number of animals are left after the first poisoning the ground should be gone over a second time.

It should be clearly understood that the method recommended by this Department consists in two steps, the first of which is to destroy the great bulk of the inhabitants of a colony by poisoning with strychnine, applied in winter or early spring when food is scarce; the second, to kill the remaining animals with bisulphide of carbon. In this way it is believed that colonies of any size may be wiped out at a total cost not to exceed 16 or 17 cents per acre, probably less.

Bisulphide is probably the most efficient single agent known for the destruction of prairie dogs, and can be used, of course, for the

extermination of colonies of any size, and at any time of year when the animals are active. If the killing is put off until late spring or early summer, when food is plenty, the animals are not likely to eat enough of the poisoned grain to amount to anything, and bisulphide becomes the best remedy. The only objection to its general use is its cost, which is likely to be about 1 cent per hole.

OBSTACLES AND DIFFICULTIES OF EXTERMINATION.

The chief obstacle to the extermination of prairie dogs on the plains is lack of cooperation among landowners. It is of little use to kill off the animals on ranches adjacent to large colonies in which the pests are allowed to go on multiplying. Many ranchmen who have again and again poisoned those on their own lands have finally given up in despair because of the rapid overflow from adjoining lands, new animals continually taking the places of those killed, until the expense and labor of repeated poisonings were too great to be continued. Complaints from this source are common in the case of ranches adjoining Government, State, or school lands, and railroad lands, and occasionally arise in the case of those adjoining lands owned by nonresidents, corporations, and certain individuals. This phase of the subject requires local legislation. In some States drastic measures have been recommended. Thus, in Texas, during the session of 1899, a bill was introduced making it the duty of every man owning land inhabited by prairie dogs to destroy the animals, under penalty of a fine not exceeding \$100 for each section or part of a section on which the pests were allowed to remain. In the case of land owned by corporations or nonresidents, the destruction of the animals was provided for, the expense to be a lien on the land. While this bill failed to become a law, it had many supporters, and goes far to show the real extent of the prairie-dog scourge.

The Kansas legislature has recently appropriated \$5,000, to be expended under the supervision of the regents of the State agricultural college, in "experiments for the purpose of determining the most effective and economical method of destroying prairie dogs and gophers," and has also authorized the township auditing boards to expend \$100 [or more if requested by two-thirds of the electors of such township] in each township each year for the destruction of these animals (approved February 12, 1901).

PRAIRIE DOGS ON NANTUCKET.

In 1890-1892, one or two pairs of prairie dogs were introduced into Nantucket, where, for several years, they increased slowly and were regarded with interest. After a few years, however, they grew so numerous and spread so rapidly that the inhabitants became greatly

alarmed and feared the animals would overrun the whole island. Mr. Outram Bangs wrote in December, 1899, that when on a visit to the island during the summer and fall of the same year he counted 200 prairie dogs visible at one time in one colony, and states that three or four such colonies existed, besides many scattering pairs and small colonies. A specimen sent the Biological Survey by Mr. Bangs proves to be the plains species (*Cynomys ludovicianus*), in rather red pelage, and probably came from some point on the Great Plains between western Kansas and Texas.

W. W. Neifert, writing from Nantucket, under date of February 12, 1900, states that ten years previously two pairs of prairie dogs were brought to the island, where they multiplied so rapidly "that they are now counted by thousands, and are a dangerous pest and nuisance, destroying crops and fields;" also, that "at a recent town meeting a committee was appointed with a view of exterminating them and an appropriation of \$350 was made to procure poison." In a subsequent letter, Mr. Neifert writes: "In addition to the \$350 raised by the town, about \$200 was subscribed by farmers and others interested. The poisoning scheme was adopted, and bisulphide of carbon was the drug. A bunch of old rags was saturated and placed in the mouth of the burrow and the hole closed with dirt or sod. This method was simple and inexpensive but did the work successfully, and now there is not a dog left to tell the tale."

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